

WHAT IS CLAIMED IS:

5 *Sub C1,*
1. ~~A method for deriving a reverse model~~
look-up table whose entries represent device
dependent colors as a function of device independent
colors, based on a forward model look-up table whose
entries represent device independent colors obtained
in response to printout of corresponding device
dependent color components, wherein the forward
10 model and the reverse model look-up tables both
comprise a grid of cells in their respective color
spaces with entries at each grid point of the grid,
the method comprising the following steps to
determine an entry in the reverse model look-up
15 table for a device independent target color:

performing a binary search of the forward
model look-up table to locate a cell that contains
the device independent target color;

20 interpolating entries from the forward
model look-up table at grid points that define the
cell so as to obtain device dependent colors
corresponding to the device independent target
color; and

25 storing the device dependent color at the
grid point of the reverse model look-up table for
the device independent target color.

30 2. A method according to Claim 1, wherein
said interpolating step comprises tetrahedral
interpolation.

35 3. A method according to Claim 1, wherein
said step of performing a binary search comprises
iterated steps starting from a starting color value
in device dependent color space, the iterated steps
comprising:

5 determining which of the multiple regions
 contains the device independent target color; and
 updating the starting color value based on
 which region contains the device independent target
 color.

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7. A method according to Claim 1, wherein the predefined colors are in CMY or CMYK space, and the colors are measured in CIEXYZ or CIELAB space.

5 8. An apparatus for deriving a reverse model look-up table whose entries represent device dependent colors as a function of device independent colors, based on a forward model look-up table whose entries represent device independent colors obtained in response to printout of corresponding device dependent color components, wherein the forward model and the reverse model look-up tables both comprise a grid of cells in their respective color spaces with entries at each grid point of the grid, 10 the apparatus comprising the following means to determine an entry in the reverse model look-up table for a device independent target color:

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15 search performing means for performing a binary search of the forward model look-up table to locate a cell that contains the device independent target color; 20

25 interpolating means for interpolating entries from the forward model look-up table at grid points that define the cell so as to obtain device dependent colors corresponding to the device independent target color; and

30 storing means for storing the device dependent color at the grid point of the reverse model look-up table for the device independent target color.

35 9. An apparatus according to Claim 8, wherein said interpolating means comprises means for performing tetrahedral interpolation.

10. An apparatus according to Claim 8, wherein said search performing means comprises means

~~for performing iterated steps starting from a
starting color value in device dependent color
space, the iterated steps comprising:~~

dividing the device independent color space
into multiple regions defined by device independent
colors corresponding to small variations from the
starting color in device dependent color space;

determining which of the multiple regions
contains the device independent target color; and

updating the starting color value based on
which region contains the device independent target
color.

11. An apparatus according to Claim 10,
wherein said determining means comprises means for
obtaining dot products for each normal plane vector
that defines the multiple regions with the vector
that defines the difference between the target color
and the device independent color corresponding to
the starting color, and determining which region
contains the device independent target color in
accordance with which of the dot products yields
positive values and which yields negative values.

12. An apparatus according to Claim 8,
wherein the device independent color space is CIEXYZ
or CIELAB color space, and wherein the device
dependent color space is CMY or CMYK color space.

13. An apparatus according to Claim 8,
wherein the forward model look-up table is derived
by printing color patches corresponding to
predefined colors in device dependent color space,
and measuring the colors of the patches in device
independent color space.

5 14. An apparatus according to Claim 8, wherein the predefined colors are in CMY or CMYK space, and the colors are measured in CIEXYZ or CIELAB space.

10 15. Computer-executable process steps stored on a computer-readable medium, the computer executable process steps to derive a reverse model look-up table whose entries represent device dependent colors as a function of device independent colors, based on a forward model look-up table whose entries represent device independent colors obtained in response to printout of corresponding device dependent color components, wherein the forward model and the reverse model look-up tables both comprise a grid of cells in their respective color spaces with entries at each grid point of the grid, the computer-executable process steps comprising the following codes to determine an entry in the reverse model look-up table for a device independent target color:

15 code to perform a binary search of the forward model look-up table to locate a cell that contains the device independent target color;

20 code to interpolate entries from the forward model look-up table at grid points that define the cell so as to obtain device dependent colors corresponding to the device independent target color; and

25 code to store the device dependent color at the grid point of the reverse model look-up table for the device independent target color.

30 16. Computer-executable process steps according to Claim 15, wherein said code to interpolate comprises code to perform tetrahedral interpolation.

according to Claim 15, wherein said code to perform a binary search comprises code to perform iterated steps starting from a starting color value in device dependent color space, the computer-executable process steps comprising:

code to divide the device independent color space into multiple regions defined by device independent colors corresponding to small variations from the starting color in device dependent color space;

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code to determine which of the multiple
regions contains the device independent target
color; and

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code to update the starting color value based on which region contains the device independent target color.

18. Computer-executable process steps according to Claim 17, wherein said code to determine comprises code to obtain dot products for each normal plane vector that defines the multiple regions with the vector that defines the difference between the target color and the device independent color corresponding to the starting color, and code to determine which region contains the device independent target color in accordance with which of the dot products yields positive values and which yields negative values.

19. Computer-executable process steps according to Claim 15, wherein the device independent color space is CIE XYZ or CIE LAB color space, and wherein the device dependent color space is CMY or CMYK color space.

~~20. Computer-executable process steps~~

according to Claim 15, wherein the forward model look-up table is derived by codes to print color patches corresponding to predefined colors in device dependent color space, and to measure the colors of the patches in device independent color space.

~~21. Computer-executable process steps~~

according to Claim 15, wherein the predefined colors are in CMY or CMYK space, and the colors are measured in CIE XYZ or CIE LAB space.

~~22. A computer-readable medium which~~

stores computer-executable process steps, the computer-executable process steps to derive a reverse model look-up table whose entries represent device dependent colors as a function of device independent colors, based on a forward model look-up table whose entries represent device independent colors obtained in response to printout of corresponding device dependent color components, wherein the forward model and the reverse model look-up tables both comprise a grid of cells in their respective color spaces with entries at each grid point of the grid, the computer-executable process steps comprising the following steps to determine an entry in the reverse model look-up table for a device independent target color:

a search performing step to perform a binary search of the forward model look-up table to locate a cell that contains the device independent target color;

an interpolating step to interpolate entries from the forward model look-up table at grid points that define the cell so as to obtain device dependent colors corresponding to the device independent target color; and

a storing step to store the device dependent color at the grid point of the reverse model look-up table for the device independent target color.

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23. A computer-readable medium according to Claim 22, wherein said interpolating step comprises tetrahedral interpolation.

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24. A computer-readable medium according to Claim 22, wherein said search performing step comprises iterated steps starting from a starting color value in device dependent color space, the computer-executable process steps comprising:

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a dividing step to divide the device independent color space into multiple regions defined by device independent colors corresponding to small variations from the starting color in device dependent color space;

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a determining step to determine which of the multiple regions contains the device independent target color; and

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an updating step to update the starting color value based on which region contains the device independent target color.

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25. A computer-readable medium according to Claim 24, wherein said determining step comprises steps to obtain dot products for each normal plane vector that defines the multiple regions with the vector that defines the difference between the target color and the device independent color corresponding to the starting color, and to determine which region contains the device independent target color in accordance with which of the dot products yields positive values and which yields negative values.

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5 26. ~~A computer-readable medium according to Claim 22, wherein the device independent color space is CIEXYZ or CIELAB color space, and wherein the device dependent color space is CMY or CMYK color space.~~

10 27. ~~A computer-readable medium according to Claim 22, wherein the forward model look-up table is derived by steps to print color patches corresponding to predefined colors in device dependent color space, and to measure the colors of the patches in device independent color space.~~

15 28. ~~A computer-readable medium according to Claim 22, wherein the predefined colors are in CMY or CMYK space, and the colors are measured in CIEXYZ or CIELAB space.~~

20 29. ~~An apparatus for deriving a reverse model look-up table whose entries represent device dependent colors as a function of device independent colors, based on a forward model look-up table whose entries represent device independent colors obtained in response to printout of corresponding device dependent color components, wherein the forward model and the reverse model look-up tables both comprise a grid of cells in their respective color spaces with entries at each grid point of the grid, the apparatus comprising:~~

25 ~~a memory including a region for storing the forward model look-up table, a region for storing the reverse model look-up table, and a region for storing executable process steps; and~~

30 ~~a processor for executing the executable process steps;~~

35 ~~wherein the executable process steps include the following steps to determine an entry in~~

the reverse model look-up table for a device independent target color: (a) performing a binary search of the forward model look-up table to locate a cell that contains the device independent target color, (b) interpolating entries from the forward model look-up table at grid points that define the cell so as to obtain device dependent colors corresponding to the device independent target color, and (c) storing the device dependent color at the grid point of the reverse model look-up table for the device independent target color.

30. An apparatus according to Claim 29, wherein said step of performing a binary search comprises iterated steps starting from a starting color value in device dependent color space, the iterated steps comprising:

dividing the device independent color space into multiple regions defined by device independent colors corresponding to small variations from the starting color in device dependent color space;

determining which of the multiple regions contains the device independent target color; and

updating the starting color value based on which region contains the device independent target color.